

MPD 1280.1

REVISION K

EFFECTIVE DATE: May 9, 2003

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# **MARSHALL POLICY DIRECTIVE**

**DA01**

## **MARSHALL MANAGEMENT MANUAL**

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### DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Canceled)	Document Revision	Effective Date	Description
Baseline		5/14/99	Document converted from MSFC-MQM to a Directive. Previous history retained in system as part of canceled or superseded ISO Document files. Revised the description of the Quality System documentation in 7.2 and 7.5 to reflect the conversion to Directives. Cancelled MMI 8040.15 to address RCAR #108. Added clarification of "grandfathering" in 2. Added definitions for "data" and "data management" to 6.
Revision	A	8/16/99	Complete revision to expand the scope to include all products and services provided by MSFC. Also updated to reflect re-structuring of the Center. Para. 4, added NPD 8070.6; para. 6, added definition of contractor, deleted "subcontractor", and revised definition of "flight hardware"; revised para. 7.1.2.1 and 7.1.4.1; changed "subcontractor" to "contractor" throughout. Added text to address safety in para. 2 and 7.1. Para. 7.1.2.1.(a)(3) updated to change signature authority for MWI from "Directorate level or below" to "Directorate level or higher."
Revision	B	9/16/99	Extended date for cancellation of MM's and MMI's in para.7.1.2.1 (4) and 7.1.2.1 (5). Added a reference to MPD 1150.1 to para. 7.1.1.3 and section 4.
Revision	C	12/6/99	Added MPG 8823.1 and MPG 8060.2 to section 4 and para. 7.8.1.1, and revised para. 7.8.1.2 and 7.1.8.9 to address all design control activities. Also, changed MM 1107.1 to MPG 1100.1 and MMI 1420.1 to MPG 1420.1 throughout document. Updated title of MPG 8060.1. Added definition 6.f for GSE. Revised 7.1.2.1(a) (4) and 7.1.2.1(a) (5) to delete dates for cancellation of MMs and MMIs. Revised description of OIs in 7.1.2.1(b).
Revision	D	3/6/00	Revised to replace references to MPG 1441.1 with MPG 1440.2.
Revision	E	6/12/00	Revised 2.1 to delete plans for expanded scope of registration; Revised 7.1.1.2.a, 7.1.1.2.c, 7.1.1.3, 7.1.2.1, 7.1.8, and 10 to clarify applicability of the scope of ISO registration vs. the MMS; Changed "software" reference in para. 7.1.5; added references to MPG 8220.1, "Conduct of Research and Technology Activities," in 4.ff. and 7.8.1.1; Clarified use of "shall" and "will" in 7.1.4.1; changed "IHS" to "The Center's subscription service for standards," in 7.1.4.1; Revised 7.1.9 to exclude servicing from the scope of registration. Updated Figure 2, MSFC Organization Chart.
Revision	F	9/12/00	Corrected the title of MPG 1410.1 in 7.1.4.1; Changed reference for software process control in 7.1.5; added reference to NASA Preferred Technical Standards in 7.1.4.1.
Revision	G	7/25/01	Revised sections throughout to implement the ISO

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			9001:2000 revision. Deleted first paragraph of 2.1. Revised Figure 1 to reflect the new 2 <sup>nd</sup> Generation Reusable Launch Vehicle Program Office. Revised definition 6.b. to clarify that customers may be internal or external. Added definitions for "quality objective" and "organization" in section 6. Expanded term defined in 6.e. Revised definition of "supplier" in 6.k. Deleted MMs and MMIs from 7.1.2.1(a). Revised 7.1.4.1 to add the new Agencywide Full-Text Technical Standards System. Paragraph 7.5.1.2, added performance, cost and schedule to basis for selection and evaluation of contractors. Paragraph 7.8.1.2 and 7.8.1.4, changed task agreements to CWCs and added risk management. Added risk management planning to 7.7.1. Made editorial corrections.
Revision	H	11/2/01	Revised the statement of scope in paragraph 2 and the quality policy statement in 7.1.1.2 in response to observations raised during a registrar audit. Updated Figure 2 in 7.1.2.2 to show the interrelationship of the Center processes. Made other minor editorial changes.
Revision	I	1/24/02	Revised 7.1.1.3 quality system objectives to ensure metrics exist and are in alignment with the MSFC values. (Changes address a minor nonconformance identified by the MSFC ISO registrar.) Added a reference to the MSFC values in 7.1.1.2. Revised 7.1.1.3, 7.8.1.2, and 7.1.4.1.
Revision	J	1/27/03	Updated URL in footers, 4.a, and 7.1.2.1; updated mission descriptions in 1; corrected title of MPG 8823.1 in 4.a.(40) and 7.8.1.1; deleted reference to obsolete versions of ISO documents in 5; revised definition 6.e; corrected reference paragraph in 7.1.8; updated filing subject titles in all sections; deleted "within our defined scope" from 7.7.1; corrected number in OMB Circular A-119 in 7.8.1.2; minor editorial corrections in 7.1.1.4.a., 7.1.1.4.c, Figure 2, 7.1.2.1, 7.1.4.1, 7.1.4.2, 7.2.2, 7.4.1, 7.6.1.1, 7.6.1.2, 7.6.1.3, 7.6.1.6, and 7.8.1.1. Revised 7.8.1.5, 7.8.1.7 and 7.8.1.8 to clarify design verification and validation in response to an NQA NCR.
Revision	K	5/9/03	Revision to comply with AS9100 requirements and other minor updates. Changed "quality records" to "records" throughout text; added AS9100 references throughout; updated the scope in section 2; changed NPD 8730.3 to NPD 1280.1 throughout; added MWI 5330.1 and MWI 8050.1 to applicable documents; revised 6.e. definition; added definition for "key characteristics"; revised 7.1.1.4.c, 7.1.3.3, 7.1.4.3, 7.1.5.2.a, 7.1.5.4.a., 7.1.5.5, 7.1.6.2, 7.1.7, 7.4.1, 7.5.1.1, 7.5.1.3.b, 7.8.1.1, 7.8.1.5, 7.8.1.6, and 7.8.3 to add/clarify AS9100 requirements; added 7.1.5.2.g.-j., 7.5.1.3.d.-f., and new paragraphs under 7.5.1.4, 7.6.1.5, 7.8.3 to add/clarify AS9100 requirements; revised measurements in section 10; added acronyms to definitions.

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## 1. PURPOSE

Marshall Space Flight Center's (MSFC) roles and missions are established and managed using the NASA Strategic Management Process as defined in NPG 1000.2, "NASA Strategic Management Handbook." This process ensures alignment between the "NASA Strategic Plan" (NPD 1000.1), the Enterprise Strategic Plans, and the Center's Implementation Plan. MSFC has been designated as the Agency's Center of Excellence for Space Propulsion. In addition, MSFC has responsibility for the following mission areas: Space Transportation Systems Development; Microgravity; and Space Optics Manufacturing Technology.

This Marshall Policy Directive (MPD) is a basic manual providing information for the organizational structure, responsibilities, procedures, processes, and resources for implementing ANSI/ISO/ASQ Q9001, "American National Standard, Quality management systems - Requirements"; SAE AS9100, "Quality Systems - Aerospace - Model for Quality Assurance in Design, Development, Production, Installation and Servicing"; and NPD 1280.1, "NASA Management System Policy." The MPD is intended to be a top-level requirements document referencing lower-tier documents with more detailed requirements and instructions.

## 2. APPLICABILITY

This MPD, "Marshall Management Manual (MMM)," establishes a Marshall Management System (MMS) to ensure consistent quality of NASA MSFC products and services and the safety of our customers, employees, and products. All activities within the MMS are conducted in compliance with ISO 9001 requirements. The scope of the MMS is as follows: All products and services provided by the Marshall Space Flight Center. MSFC supports the NASA Agency infrastructure and is a major contributor to all its scientific and technical enterprises.

Additionally, the design, development, production, installation and servicing of flight hardware, flight software, and associated ground support equipment interfacing with flight hardware and flight software is conducted in compliance with AS9100 requirements.

All in-scope flight hardware, flight software, and ground support equipment (GSE) previously grandfathered for ISO registration and surveillance audits, when readied for re-flight, shall be considered in scope to the ISO 9001 and AS9100 requirements and this MMM. Exceptions shall be addressed case-by-case utilizing the process as defined in MPG 1410.2.

## 3. AUTHORITY

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NPD 1280.1, "NASA Management System Policy"

#### 4. APPLICABLE DOCUMENTS

a. MSFC Directives: (All MSFC Directives are accessible through <https://repository.msfc.nasa.gov/directives/directives.htm>.)

- (1) MPG 1050.1, "Contract (Customer Agreement) Review"
- (2) MPG 1100.1, "Marshall Space Flight Center Organizational Manual"
- (3) MPG 1130.1, "MSFC Implementation Planning Process"
- (4) MPD 1150.1, "Establishment of Councils, Boards, and Committees"
- (5) MPG 1280.1, "Management Review"
- (6) MPG 1280.2, "Process Control"
- (7) MWI 1280.3, "Corrective/Preventive Action Notification System"
- (8) MPG 1280.4, "MSFC Corrective Action System"
- (9) MWI 1280.5, "MSFC ALERT Processing"
- (10) MPG 1280.6, "Internal Quality Audits"
- (11) MPG 1280.7, "Servicing"
- (12) MPG 1280.8, "Customer Satisfaction"
- (13) MPG 1280.9, "Continual Improvement"
- (14) MPG 1410.1, "Documentation and Data Control for Organizational Issuances"
- (15) MPG 1410.2, "Marshall Management Directives System"
- (16) MPG 1420.1, "MSFC Forms Management Program"
- (17) MPG 1440.2, "MSFC Records Management Program"
- (18) MPG 1600.1, "MSFC Security Procedures and Guidelines"

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- (19) MPD 2210.1, "Documentation Input and Output of the MSFC Documentation Repository"
- (20) MPG 3410.1, "Training"
- (21) MPG 4000.1, "Control of Customer-Supplied Product"
- (22) MPG 5000.1, "Purchasing"
- (23) MWI 5330.1, "Evaluation of Contractors, Suppliers, and Vendors"
- (24) MPG 6410.1, "Handling, Storage, Packaging, Preservation, and Delivery (H.S.P.P.&D.)"
- (25) MPG 7100.1, "Proposal Development Process"
- (26) MPG 7120.1, "Program/Project Planning"
- (27) MPG 7120.2, "Multiprogram/Project Common-Use Documentation"
- (28) MPG 7120.3, "Data Management, Programs/Projects"
- (29) MWI 7120.4, "Documentation Preparation, Programs/Projects"
- (30) MPG 8040.1, "Configuration Management, MSFC Programs/Projects"
- (31) MPG 8040.2, "Product Identification"
- (32) MPG 8040.3, "Product Traceability"
- (33) MWI 8050.1, "Verification & Validation of Hardware, Software and Ground Support Equipment for MSFC Projects"
- (34) MPG 8060.1, "Flight Systems Design/Development Control"
- (35) MPG 8060.2, "Non-Flight and Non-Facility Design and Development"
- (36) MPG 8220.1, "Conduct of Research and Technology Activities"
- (37) MPG 8730.1, "Inspection and Testing"
- (38) MPG 8730.2, "Inspection and Test Status"
- (39) MPG 8730.3, "Control of Nonconforming Product"
- (40) MPG 8730.4, "Statistical Techniques"



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(41) MPG 8730.5, "Control of Inspection, Measuring, and Test Equipment"

(42) MPG 8823.1, "Design Control of Facilities"

b. NASA Directives other than those listed above may be applicable to MSFC activities. NASA Directives: (All NASA Directives are accessible at [http://nodis3.gsfc.nasa.gov/library/main\\_lib.html](http://nodis3.gsfc.nasa.gov/library/main_lib.html))

(1) NPD 1000.1, "NASA Strategic Plan"

(2) NPG 1000.2, "NASA Strategic Management Handbook"

(3) NPD 1280.1, "NASA Management System Policy"

(4) NPD 7120.4, "Program/Project Management"

(5) NPG 7120.5, "NASA Program and Project Management Processes and Requirements"

(6) NPD 8070.6, "Technical Standards"

c. Other:

(1) Enterprise Strategic Plans

(2) Federal Acquisition Regulation (FAR)

(3) MIL-STD-961, Defense Specifications

(4) MSFC Implementation Plan

(5) NASA Federal Acquisition Regulation Supplement (NFS)

(6) OMB Circular A-119, "Federal Participation in the Development and Use of Voluntary Standards"

## 5. REFERENCES

a. ANSI/ISO/ASQ Q9000-2000, "American National Standard, Quality management systems - Fundamentals and vocabulary"

b. ANSI/ISO/ASQ Q9001-2000, "American National Standard, Quality management systems - Requirements"

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c. SAE AS9100, "Quality Systems - Aerospace - Model for Quality Assurance in Design, Development, Production, Installation and Servicing"

## 6. DEFINITIONS

In general, the definitions given in ANSI/ISO/ASQ Q9000-2000 apply. However, the following definitions are offered to assist the user in understanding the application of the ANSI/ISO/ASQ Q9001 and AS9100 standards and the quality policies in this MPD:

a. Contractor. The organization that provides a product or service to MSFC in a contractual situation.

b. Customer. The recipient of a product or service provided by MSFC. A customer may be internal to MSFC or external.

c. Data. Any electronic or written information/statement which represents policies, procedures, instructions, instructional material, drawings, plans, specifications, requirements, handbooks, manuals, reports, standards, or other correspondence. These may be stored in a variety of media such as magnetic tapes, computer disks, data sheets, log books, strip charts, photographs, videocassettes, etc.

d. Data Management. The timely and economical identification/definition, preparation, control, and disposition of documents and data required by a program, project, or activity.

e. Flight Hardware, Flight Software, and Ground Support Equipment (GSE). Any hardware or software that is intended to fly in, or is part of, the Shuttle Transportation System (STS) or some other flight system. Hardware and software intended only to fly on a balloon flight, sounding rocket, or aircraft flight are excluded from this definition.

f. Ground Support Equipment. Non-flight systems, equipment, or devices (with a physical or functional interface with flight hardware) necessary to routinely support the operations of transporting, receiving, handling, assembly, inspection, test, checkout, servicing and launch of space vehicles and payloads at launch, landing, or retrieval sites.

g. Key characteristics. The features of a material, process, or part whose variation has a significant influence on product fit, performance, service life, or manufacturability.

h. NPD. NASA Policy Directive.

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- i. NPG. NASA Procedures and Guidelines.
- j. Organization. Group of people and facilities with an arrangement of responsibilities, authorities, and relationships.
- k. Process. Set of interrelated resources and activities which transform inputs into outputs. Resources may include personnel, finance, facilities, equipment, techniques, and methods.
- l. Product. The result of activities or processes which is delivered to the customer.
- m. Quality Objective. Something sought, or aimed for, related to quality. Quality objectives are generally based on the MSFC quality policy and should be measurable.
- n. Service. The results generated by activities at the interface between the supplier and the customer and by supplier internal activities to meet customer needs.
- o. Supplier. The organization that provides a product/service to the customer. A supplier can be internal or external. In a contractual situation, a supplier is sometimes called a "contractor."

## 7. POLICY

### 7.1 ORGANIZATION AND ADMINISTRATION (1000-1999)

MSFC shall establish and maintain documented procedures/instructions for safety, general, management, and administrative processes and continually improve its effectiveness.

The following processes are governed by the organization and administration series: (See paragraph 4.a.)

- a. General (10XX)
- b. Organizational Structure (11XX)
- c. Internal Management Controls (12XX)
- d. External Relationships (13XX)
- e. Administrative Management Programs (14XX)
- f. Administrative Services (15XX)
- g. Security (16XX)
- h. Safety (17XX)
- i. Occupational Health (18XX)
- j. Standards of Conduct (19XX)

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### 7.1.1 MANAGEMENT RESPONSIBILITY

#### 7.1.1.1 MANAGEMENT COMMITMENT

MSFC senior management shall provide evidence of its commitment to the development and implementation of the MMS and continually improving its effectiveness by:

- (a) communicating to the organization the importance of meeting customer as well as statutory and regulatory requirements,
- (b) establishing the quality policy,
- (c) ensuring that quality objectives are established,
- (d) conducting management reviews, and
- (e) ensuring the availability of resources.

MSFC senior management shall ensure that the integrity of the MMS is maintained when changes are planned and implemented.

MSFC senior management shall ensure that appropriate communication processes are established within MSFC and that communication takes place regarding the effectiveness of the MMS.

#### 7.1.1.2 QUALITY POLICY

##### Quality Policy

MSFC policy is to provide quality products and services to our customers through the Marshall values: people, customers, excellence, teamwork, and innovation.

The MSFC values serve as the principles that guide our decisions and behaviors. These core values can be found online through the "Inside Marshall" page.

Each MSFC manager shall be responsible for ensuring the quality policy is understood, implemented, and maintained at all levels of the organization.

This quality policy will be communicated throughout the organization via ISO orientation, employee training, and quality reviews with management.

#### 7.1.1.3 QUALITY OBJECTIVES

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The MSFC Center Director shall ensure that quality objectives, including those needed to meet requirements for product, are established at relevant functions and levels within the organization. The quality objectives shall be measurable and consistent with the quality policy.

Center level objectives, including quality objectives, are established for each fiscal year in the MSFC Implementation Plan. (Reference MPG 1130.1, "MSFC Implementation Planning Process.") Directorates/Offices develop objectives and metrics appropriate at that level.

Other objectives used to assess the health of the MMS and to identify opportunities for improvement are listed below with the MSFC value(s) they support:

<u>Objective</u>	<u>MSFC Value</u>
(a) Create a safe and healthy environment	People
(b) Satisfy our customers with our products and services	Customers
(c) Provide a continuously learning workforce	Excellence
(d) Improve corrective action response time	Teamwork
(e) Continually improve our processes	Innovation

#### 7.1.1.4 ORGANIZATION

##### a. RESPONSIBILITY AND AUTHORITY

The MSFC Center Director is responsible for implementation and control of the MMS. While the Center Director has the ultimate authority and responsibility for establishing and maintaining the MMS (reference NPD 1280.1), the Management Representative has the day-to-day authority and responsibility for the MMS implementation. All MSFC directors, program/project managers, and other personnel are responsible for understanding and complying with the MMS and MSFC's policy and objectives for quality. The directors and program/project managers may delegate authority for the quality program, but they will maintain the responsibility. (Figure 1 shows the organizational relationships at MSFC.)

Responsibility and authority for employees are defined in the employee's performance plan and through process and/or procedural documentation. Individual performance plans and job descriptions document the responsibilities and authority of all personnel. Organizational charters are documented in MPG 1100.1, "Marshall Space Flight Center Organizational Manual."

##### b. RESOURCES

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The MSFC Center Director shall be responsible for providing sufficient resources to implement and maintain the MMS and continually improve its effectiveness, and to enhance customer satisfaction by meeting customer requirements.

#### c. MANAGEMENT REPRESENTATIVE

The MSFC Center Director has appointed the Associate Director as the Management Representative. This position has the organizational freedom to resolve matters pertaining to quality. The Management Representative shall ensure that the MMS is established, implemented, and maintained in accordance with ANSI/ISO/ASQ Q9001 and SAE AS9100, and report on the performance of the MMS to Center management for review and improvement. The Management Representative will ensure the promotion of awareness of customer requirements throughout the organization. The Management Representative will also act as the primary communications point for liaison with external bodies affecting the scope of ISO 9001 and AS9100 registration.

#### 7.1.1.5 MANAGEMENT REVIEW

The Management Representative reports at least twice annually to the MSFC Quality Council (MQC) on the status of the MMS. These reviews are conducted and records are kept per MPG 1280.1, "Management Review," to ensure the continuing suitability, adequacy, and effectiveness of the MMS. The MQC assesses opportunities for improvement and the need for changes to the MMS, including quality policy and quality objectives. Membership and operation of the MQC is defined under MPD 1150.1, "Establishment of Councils, Boards, and Committees," Charter Number MC-02.

The input to these management reviews includes information on results of audits, customer feedback, process performance and product conformity, status of preventive and corrective actions, follow-up actions from previous management reviews, changes that could affect the MMS, and recommendations for improvement.

The output from these management reviews includes any decisions and actions related to improvement of the effectiveness of the MMS and its processes, improvement of the products related to customer requirements, and resource needs.

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## MSFC Organization



FIGURE 1.

George C. Marshall Space Flight Center Organizational Chart

### 7.1.2 QUALITY SYSTEM

#### 7.1.2.1 GENERAL

MSFC shall establish, document, maintain, and continually improve an MMS as a means of ensuring that MSFC's products and services conform to specified requirements and to ensure conformance to the requirements of ANSI/ISO/ASQ Q9001 and SAE AS9100. MSFC has prepared this MMM covering the requirements of ANSI/ISO/ASQ Q9001, SAE AS9100, and other NASA and MSFC requirements.

The Management Representative is responsible for maintenance of this MMM. The controlled version is available on the World Wide Web (WWW) via the MSFC Management Directives Master List at <https://repository.msfc.nasa.gov/directives/directives.htm>. By definition, any printed version of this MMM is uncontrolled. Any proposed revision to this manual shall be submitted to the Center Director. The Center Director authorizes approval of the revision after an internal review by the Directives Control Board, chaired by the Management Representative.

CHECK THE MASTER LIST at <https://repository.msfc.nasa.gov/directives/directives.htm>  
VERIFY THAT THIS IS THE CORRECT VERSION BEFORE USE

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The MMM includes or makes reference to the MMS procedures and outlines the structure of the documentation used in the MMS. Authority, applicable, and reference documents form a part of the citing document to the extent specified. Unless otherwise specified, the documents referred to are the latest approved versions. The MSFC documentation hierarchy is defined as follows:

(a) Marshall Management Directives System (MMDS). The MMDS consists of Marshall Policy Directives (MPDs), Marshall Procedures and Guidelines (MPGs), and Marshall Work Instructions (MWIs) (refer to MPG 1410.2, "Marshall Management Directives System"):

(1) MPD. MPDs are issued to state policy and formal delegations of authority; identify responsibilities and principal policy relationships; and are approved/signed by the Center Director or designee.

(2) MPG. MPGs document procedural requirements or guidelines for how Center-level activities are conducted to implement NASA and/or MSFC policy and are approved/signed by the Center Director or designee.

(3) MWI. MWIs provide detailed instructions on performing specific duties that apply to all or numerous MSFC organizations and are approved/signed by the Center Director or designee.

(b) Organizational Issuances (OIs). OIs provide detailed instructions for internal use within an organization. OIs may apply to two or more organizations if issued jointly by heads of the organizations involved. OIs are not maintained in the MMDS. OIs include, but are not limited to, organizational work instructions (OWIs), processes, procedures, memoranda, and organizational forms. (Refer to MPG 1410.1, "Document and Data Control for Organizational Issuances.")

(c) Program/Project Data. Program/Project data includes all data required for the definition of the product and the management of the Program/Project. The management of Program/Project data will be in accordance with MPG 7120.3, "Data Management, Programs/Projects."

(d) Multiprogram/Project Common-Use Documentation. Technical descriptive standards, handbooks, or specifications prepared for common use by MSFC shall be in accordance with MPG 7120.2, "Multiprogram/Project Common-Use Documentation."



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(e) All records are documented and retained according to MPG 1440.2, "MSFC Records Management Program."

#### 7.1.2.2 QUALITY SYSTEM PROCEDURES

MSFC activities can be represented as a process or set of processes. Processes and their interactions are identified at all levels of the organization in order to manage and document the quality system effectively.

The following model illustrates the process approach:

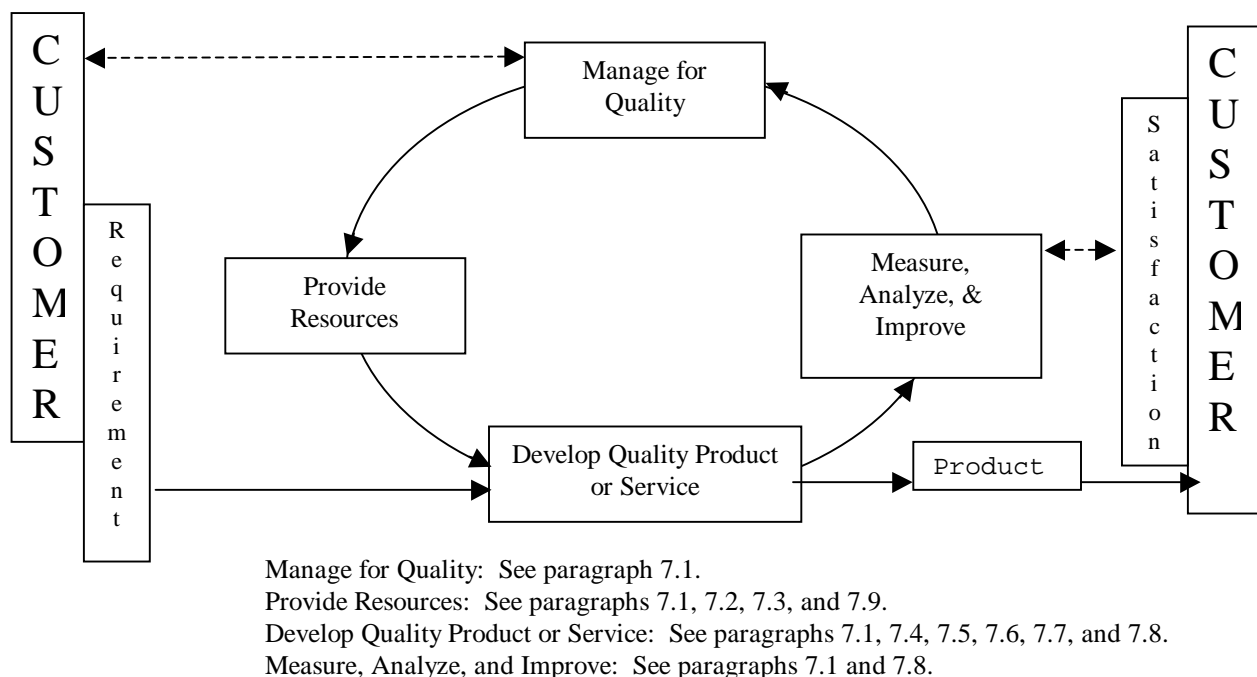


FIGURE 2. PROCESS MODEL FOR MSFC MANAGEMENT SYSTEM

The MMS is a formally documented system of planned activities established to provide evidence of compliance to the requirements of applicable regulations, codes, standards, specifications, drawings, and the MSFC quality policy and quality objectives. All of these activities are governed by procedures and written instructions supported with records of objective evidence of satisfactory compliance. All organizations shall establish measures to implement the MMM requirements. This includes the preparation of procedures and documentation that assures compliance with the MMM, and continual improvement of these processes.

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The range and detail of the procedures that form part of the MMS depend on the complexity of the work, the methods used, and the skills and training needed by personnel involved in carrying out the activity. Procedures may make reference to work instructions that define how an activity is performed.

#### 7.1.2.3 ANALYSIS OF DATA

MSFC shall determine, collect, and analyze appropriate data to demonstrate the suitability and effectiveness of the MMS and to evaluate where continual improvement of the effectiveness of the MMS can be made. This shall include data generated as a result of monitoring and measurement and from other relevant sources.

The analysis of data shall provide information relating to:

- (a) customer satisfaction (see paragraph 7.1.3.5),
- (b) conformity to product requirements (see paragraph 7.8.3),
- (c) characteristics and trends of processes and products including opportunities for preventive action (see paragraph 7.1.5.5), and
- (d) suppliers (see paragraphs 7.5.1.2 and 7.5.1.4).

#### 7.1.2.4 CONTINUAL IMPROVEMENT

MSFC shall continually improve the effectiveness of the MMS through the use of the quality policy, quality objectives, audit results, analysis of data, corrective and preventive actions, and management review. (See MPG 1280.9, "Continual Improvement.")

### 7.1.3 CUSTOMER-RELATED PROCESSES

#### 7.1.3.1 GENERAL

The directors and program/project managers shall ensure that customer requirements are determined and met with the aim of enhancing customer satisfaction. Procedures/instructions for customer-related processes, including contract (customer agreement) review and the coordination of these activities, are detailed in MPG 1050.1, "Contract (Customer Agreement) Review," MPG 7120.1, "Program/Project Planning," and MPG 7100.1, "Proposal Development Process."

#### 7.1.3.2 DETERMINATION OF REQUIREMENTS RELATED TO PRODUCTS

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MSFC shall determine requirements specified by the customer, including the requirements for delivery and post-delivery activities; requirements not stated by the customer but necessary for specified or intended use, where known; statutory and regulatory requirements related to products; and any additional requirements determined by MSFC.

#### 7.1.3.3 REVIEW OF REQUIREMENTS RELATED TO PRODUCTS

MSFC shall review the requirements related to products. This review shall be conducted prior to MSFC's commitment to supply a product to a customer (e.g. submission of tenders, acceptance of contracts or orders, acceptance of changes to contracts or orders) and shall ensure that product requirements are defined, contract or order requirements differing from those previously expressed are resolved, MSFC has the ability to meet the defined requirements, and risks (e.g., new technology, short delivery time scale) have been evaluated. Records of the results of these reviews and actions arising from these reviews shall be maintained (see paragraph 7.1.7).

Where the customer provides no documented statement of requirement, the customer requirements shall be confirmed by MSFC before acceptance. Where product requirements are changed, MSFC shall ensure that relevant documents are amended and that relevant personnel are made aware of the changed requirements.

#### 7.1.3.4 CUSTOMER COMMUNICATION

MSFC shall determine and implement effective arrangements for communicating with customers in relation to product information; inquiries, contracts, or order handling, including amendments; and customer feedback, including customer complaints.

#### 7.1.3.5 CUSTOMER SATISFACTION

As one of the measurements of the performance of the MMS, MSFC shall monitor information relating to customer perception as to whether MSFC has met customer requirements. The methods for obtaining and using this information are defined in MPG 1280.8, "Customer Satisfaction."

### 7.1.4 DATA MANAGEMENT, INCLUDING DOCUMENT AND DATA CONTROL

#### 7.1.4.1 GENERAL

MSFC shall establish and maintain documented procedures to identify/define, prepare, control, and disposition all documents and data that are within the scope of MSFC's MMS including, to

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the extent applicable, documents of external origin such as standards and customer drawings. Procedural controls include requirements to periodically review and update as necessary and re-approve documents. (Refer to MPG 1410.2, "Marshall Management Directives System;" MPG 1410.1, "Document and Data Control for Organizational Issuances;" MPG 7120.3, "Data Management, Programs/Projects;" MPG 7120.2, "Multiprogram/Project Common-Use Documentation;" and MPG 1420.1, "MSFC Forms Management Program.") All records are documented, retained, and dispositioned in accordance with MPG 1440.2, "MSFC Records Management Program." The MSFC Documentation Repository is the official receipt, storage, and distribution point for MSFC engineering drawings, specifications, standards, procedures, and handbooks.

The use of the words "shall" or "will" indicates mandatory requirements in the documentation of the MMS. The use and meaning of these terms in specifications are controlled by MIL-STD-961, as referenced in MWI 7120.4. In accordance with MIL-STD-961, verification is required only for mandatory requirements as indicated by the use of the word "shall" in the specification.

The NASA Technical Standards Program's Agencywide Full-Text Technical Standards System serves as the master list for searching for information about various Technical Standards Products, including NASA Preferred Technical Standards. The Agencywide Full-Text Technical Standards System is accessible from the NASA Technical Standards Program's website at <http://standards.nasa.gov> and the MSFC Integrated Document Library (MIDL) through the Technical Standards link.

Changes to technical standards can have major impacts on the safety and performance of MSFC Programs and Projects. The Standards Update Notification System (SUNS) is a Web-based system developed to notify NASA's Programs/Projects/Organizations and contractors within the <nasa.gov> domain of changes to standards products being used. The SUNS is also accessible from the NASA Technical Standards Program website at <http://standards.nasa.gov>.

MSFC and NASA master document lists shall be used to verify the correct version status of MSFC and NASA standards documentation and previous/obsolete versions authorized for use at MSFC.

#### 7.1.4.2 DOCUMENT AND DATA APPROVAL AND ISSUE

The documents and data are reviewed and approved for adequacy and accuracy prior to issue to perform work by authorized management, or designee, after having received concurrence by technical authorities and employee representatives performing the tasks. Each organization maintains the documents and data or identifies

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the repository location of the documents and data such that each employee who is performing the task can easily retrieve the applicable documents/data for use. These documents can be in the form of any type of media; electronic media is recommended when available. Master lists identifying the current revision status of documents, as well as previous versions authorized for use, shall be established and readily accessible from a central location to preclude the use of invalid and/or obsolete documents. This control shall ensure that:

(a) Pertinent issues of appropriate documents are available at all locations essential to the effective functioning of the MMS.

(b) Invalid and/or obsolete documents are promptly removed from all points of issue or use, destroyed, or otherwise ensured against unintended use.

(c) Any previous/obsolete version of any documents within the MSFC Master List system retained by the user (e.g., for limited applicability, for historical purposes, for reference) will be marked or otherwise suitably identified.

#### 7.1.4.3 DOCUMENT AND DATA CHANGES

Changes, revisions, and cancellations to documents and data shall be reviewed and approved by the same MSFC organizations that performed the original review and approval, unless designated otherwise. Document changes will be coordinated with customers and/or regulatory authorities in accordance with any customer agreement or regulatory requirements. The designated MSFC organizations performing review and approval shall have access to pertinent background information upon which to base their review and approval. Where practicable, a description of the change shall be identified in the document or in the appropriate attachments.

#### 7.1.5 PROCESS CONTROL

##### 7.1.5.1 INFRASTRUCTURE

MSFC shall determine, provide, and maintain the infrastructure needed to achieve conformity to product requirements. Infrastructure includes, as applicable:

- (a) buildings, workspace, and associated utilities,
- (b) process equipment (both hardware and software), and
- (c) supporting services (such as transport or communication).

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#### 7.1.5.2 CONTROL OF PRODUCTION AND SERVICE PROVISION

Procedures and instructions are developed on an ongoing basis by responsible organizations to ensure functional activities are performed under controlled conditions. The methods for process controls for specific processes can be obtained through the MIDL. Process controls for hardware and software products are carried out in accordance with MPG 1280.2, "Process Control." Process controls for post-delivery servicing activities are carried out in accordance with MPG 1280.7, "Servicing."

Controlled conditions shall include, as applicable:

- (a) the availability of information that describes the characteristics of the product, including criteria for workmanship, which shall be stated in the clearest practical manner (e.g., written standards, representative samples or illustrations),
- (b) the availability of work instructions, as necessary,
- (c) the use of suitable equipment,
- (d) the availability and use of monitoring and measuring devices,
- (e) the implementation of monitoring and measurement,
- (f) the implementation of release, delivery, and post-delivery activities,
- (g) accountability for all product during manufacture,
- (h) evidence that all manufacturing and inspection operations have been completed as planned, or as otherwise documented and authorized,
- (i) provision for the prevention, detection, and removal of foreign objects, and
- (j) monitoring and control of utilities and supplies such as water, compressed air, electricity and chemical products to the extent they affect product quality.

#### 7.1.5.3 WORK ENVIRONMENT

MSFC shall determine and manage the work environment needed to achieve conformity to product requirements.

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#### 7.1.5.4 VALIDATION OF PROCESSES FOR PRODUCTION AND SERVICE PROVISION

MSFC validates any processes for production and service provision where the resulting output cannot be verified by subsequent monitoring or measurement. This includes any processes where deficiencies become apparent only after the product is in use or the service has been delivered.

Validation shall demonstrate the ability of these processes to achieve planned results. MSFC shall establish arrangements for these processes including, as applicable:

- (a) defined criteria for review and approval of the processes prior to use,
- (b) approval of equipment and qualification of personnel,
- (c) use of specific methods and procedures,
- (d) requirements for records (see paragraph 7.1.7), and
- (e) revalidation.

#### 7.1.5.5 MONITORING AND MEASUREMENT OF PROCESSES

MSFC shall apply suitable methods for monitoring and, where applicable, measurement of the MMS processes. These methods shall demonstrate the ability of the processes to achieve planned results. When planned results are not achieved, correction and corrective action shall be taken, as appropriate, to ensure conformity of product. Any resulting nonconforming product will be identified and controlled. (See paragraphs 7.1.6, 7.8.3, and 7.8.6.)

#### 7.1.6 CORRECTIVE AND PREVENTIVE ACTION

##### 7.1.6.1 GENERAL

MSFC shall establish and maintain documented procedures to ensure consistent and effective methods for correction and prevention of recurrence of nonconformances. A consistent procedure to ensure that nonconformances are corrected is necessary for the delivery of quality product to the customer. Any corrective or preventive action taken to eliminate the causes of actual or potential nonconformities shall be to a degree appropriate to the magnitude of problems and commensurate with the risks encountered. Any

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changes to the documented procedures as a result of corrective or preventive actions shall be recorded and implemented.

#### 7.1.6.2 CORRECTIVE ACTION

MSFC shall establish procedures for the effective handling of customer concerns or complaints and reports of product nonconformances. (Refer to MPG 1280.4, "MSFC Corrective Action System.") Disciplined problem-solving methods shall be used during investigation of cause of nonconformance to specification or requirement relating to product, process, and Management System. Results of the investigation and analysis shall be recorded (see paragraph 7.1.7). Procedures shall be established for determination of corrective action needed to eliminate the cause of nonconformances, and shall define corrective action follow-up activity to ensure documented corrective action is taken and that it is effective. Corrective actions will be flowed down to a supplier when it is determined that the supplier is responsible for the root cause. (See MPG 5000.1, "Purchasing.")

#### 7.1.6.3 PREVENTIVE ACTION

MSFC shall determine action to eliminate the causes of potential nonconformities in order to prevent their occurrence. Preventive actions shall be appropriate to the effects of potential problems. Documented procedures define requirements for determining potential nonconformities and their causes, evaluating the need for action to prevent occurrence of nonconformities, determining and implementing action needed, records of results of actions taken, and reviewing preventive action taken. (Refer to MPG 1280.4, "MSFC Corrective Action System;" MWI 1280.5, "MSFC ALERT Processing;" and, MWI 1280.3, "Corrective/Preventive Action Notification System.")

#### 7.1.7 CONTROL OF RECORDS

Records activities are performed in accordance with MPG 1440.2, "MSFC Records Management Program." To ensure control of records:

(a) MSFC shall establish and maintain documented procedures for the identification, collection, indexing, filing, storage, accessing, maintenance, and disposition of records.

(b) Records, including pertinent records from MSFC customers and suppliers, shall be maintained to demonstrate conformance to specified requirements and the effective operation of the MMS.



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(c) MSFC shall ensure records are legible and shall be stored and retained in such a way that they are readily retrievable and not subject to damage, deterioration, or loss. Retention times shall be established and recorded.

Records shall be available for review by customers and regulatory authorities in accordance with customer agreements or regulatory requirements.

#### 7.1.8 INTERNAL AUDITS

Safety and Mission Assurance (S&MA) shall establish and maintain documented procedures for planning and implementing internal quality audits. (Refer to MPG 1280.6, "Internal Quality Audits.") Internal audits are used to ensure conformity of the MMS, and to continually improve the effectiveness of the MMS through corrective actions taken by the audited organizations.

MSFC shall plan and perform internal audits on a scheduled basis, taking into consideration the status and importance of the processes and areas to be audited, as well as results of previous audits. The results shall be documented and maintained as records (see paragraph 7.1.7) and distributed to affected organizations. Nonconformances identified shall be tracked to ensure that timely corrective action is taken by the management of the affected area.

MSFC activities shall be audited by personnel independent of the activity under review to determine compliance with ISO 9001, AS9100, documented procedures, plans, instructions, regulatory requirements, and accepted customer agreements, and to determine the effectiveness of the MMS.

Follow-up audits shall be performed by MSFC to verify and record the implementation and effectiveness of the corrective action taken and shall be maintained as records (see paragraph 7.1.7). Corrective action commitments made in response to audit findings are assessed to ensure implementation and effectiveness of the action.

The results of audits are an integral part of the input to the management review activities (see paragraph 7.1.1.5).

### 7.2 LEGAL AND TECHNICAL (2000-2999)

#### 7.2.1 LEGAL

The MSFC Chief Counsel's Office has established and shall maintain appropriate procedures, office issuances, and records

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for the implementation, generation, and control of legal and patent functions/processes.

The Chief Counsel's Office activities are governed by the Legal and Technical series: (See para. 4.a.)

General (Laws and Legal Matters) (20XX)

#### 7.2.2 TECHNICAL

MSFC shall establish and maintain documented procedures/instructions for the management and operation of MSFC's scientific and technical information programs, including the technology utilization office. Records are maintained.

The following activities are governed by the Legal and Technical series: (See paragraph 4.a.)

- a. Technology Utilization (including Small Business Innovative Research(SBIR)) (21XX)
- b. Scientific and Technical Information (22XX)
- c. Management Information Systems (23XX)
- d. Automatic Data Processing (ADP) Management (24XX)
- e. Communications (25XX)
- f. Photographic Services Management (26XX)
- g. Information Technology (IT) Management (28XX)

#### 7.3 HUMAN RESOURCES/PERSONNEL (3000-3999)

MSFC shall establish and maintain documented procedures/instructions for the management and operation of NASA personnel functions.

The following activities are governed by the Human Resources/Personnel series: (See paragraph 4.a.)

- a. Human Resources/Personnel (General) (30XX)
- b. Executive Human Resources Management (Senior Executive Service (SES)) (31XX)
- c. Personnel Provisions (General) (32XX)
- d. Employment (General) (33XX)
- e. Employee Performance and Utilization (34XX)
- f. Position Classification, Pay, and Allowances (35XX)
- g. Time and Attendance (36XX)
- h. Personnel Relations and Services (37XX)
- i. Insurance and Annuities (38XX)
- j. General and Miscellaneous (39XX)

##### 7.3.1 COMPETENCE, AWARENESS, AND TRAINING

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MSFC shall establish and maintain documented procedures that identify the competency and training needs and provide appropriate training of personnel. (Refer to MPG 3410.1, "Training.") Appropriate records of education, training, skills, and experience are maintained as records (see paragraph 7.1.7).

Personnel performing work affecting product quality shall be competent on the basis of appropriate education, training, skills, and experience.

MSFC shall determine the necessary competence for personnel. MSFC shall provide training or take other actions to satisfy these needs and evaluate the effectiveness of the actions taken. MSFC shall ensure that personnel are aware of the relevance and importance of their activities and how they contribute to the achievement of the objectives, including quality objectives.

#### 7.4 PROPERTY AND SUPPLY (4000-4999)

MSFC shall establish and maintain documented procedures/instructions for the management and operation of NASA property and supply management functions.

The following activities are governed by the Property and Supply series: (See paragraph 4.a.)

- a. Property and Supply (General) (40XX)
- b. Inventory Management (General) (41XX)
- c. Equipment Management (General) (42XX)
- d. Utilization and Disposal (43XX)
- e. Supply Cataloging (44XX)
- f. Storage and Distribution (45XX)
- g. Expanded Supply Control (46XX)

##### 7.4.1 CONTROL OF CUSTOMER-SUPPLIED PRODUCT

MSFC shall exercise care with property belonging to an external customer while it is under MSFC's control or being used by MSFC. MSFC establishes and maintains documented procedures to control the verification, storage, and maintenance of customer-supplied products provided for use or incorporation into MSFC products. (Refer to MPG 4000.1, "Control of Customer-Supplied Product.") Unless specified otherwise by the customer, all customer-supplied products, from time of receipt until the time they are transferred out of the MSFC MMS, are verified, stored, and maintained in accordance with the requirements and procedures applicable to MSFC hardware of the same classification.

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External customer-supplied products which are lost, damaged, or are found to be otherwise unsuitable for use, are recorded and reported to the customer.

Customer property can include intellectual property, including customer-furnished data used for design, production and/or inspection. Proprietary/confidential documentation received by MSFC is controlled in accordance with MPG 7120.3, "Data Management, Programs/Projects," MWI 7120.4, "Documentation Preparation, Programs/Projects," MPG 1600.1, "MSFC Security Procedures and Guidelines," and MPD 2210.1, "Documentation Input/Output of the MSFC Documentation Repository."

## 7.5 PROCUREMENT/SMALL BUSINESS/INDUSTRIAL RELATIONS (5000-5999)

MSFC shall establish and maintain documented procedures/instructions for the management and operation of NASA procurement and contracting functions.

The following activities are governed by the Procurement/Small Business/Industrial Relations series: (See paragraph 4.a.)

- a. Procurement/Small Business/Industrial Relations (General) (50XX)
- b. Procurement (Contracts) - General (51XX)
- c. Contractor Labor Relations (52XX)
- d. Reliability and Quality Assurance (53XX)
- e. Contractor-Held Government Property (54XX)
- f. Patent Waiver (55XX)
- g. Statement of Work (56XX)
- h. Awards, Inventions, and Contributions (57XX)
- i. Grants and Cooperative Agreements (58XX)
- j. Contractor Financial Management and Reporting (59XX)

### 7.5.1 PURCHASING

#### 7.5.1.1 GENERAL

MSFC shall establish and maintain documented procedures to ensure that purchased product and services conform to specified requirements. (Refer to MPG 5000.1, "Purchasing" and MWI 5330.1, "Evaluation of Contractors, Suppliers, and Vendors.") Procedures shall ensure that materials received conform to the applicable drawings, specifications, and quality standards. Verification methods employed are: Quality System Surveys and Audits, Source Inspections, Supplier Performance Evaluations, and inspection and test of materials upon receipt. Outsourced processes that can affect product conformity are also controlled by procedures.

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MSFC personnel adhere to the following regulations and guidelines for all MSFC procurements:

- (a) NASA procurements shall be conducted in accordance with the Federal Acquisition Regulation (FAR) and the NASA FAR Supplement.
- (b) Contractor procurements shall be conducted in accordance with the contractor's company purchasing procedures and standard commercial practices and contain any FAR flow-down clauses.
- (c) Where appropriate and beneficial to NASA, contractors shall be contractually required to have quality systems that comply with or are registered to the ISO 9001 or AS9100 standard.

#### 7.5.1.2 ASSESSMENT OF CONTRACTORS

MSFC evaluates and selects contractors on the basis of their ability to meet all specified requirements including performance, cost, and schedule, as well as the quality system and any specific quality assurance requirements. Criteria for selection, evaluation, and re-evaluation shall be established. Records of the results of evaluations and any necessary actions arising from the evaluation shall be maintained (see paragraph 7.1.7). The various methods used in this assessment are:

- (a) Quality System Evaluations and/or Surveys
- (b) Past Performance Evaluations and Customer Questionnaires
- (c) Capability or Mission Suitability Evaluations

The type and extent of control exercised over contractors shall be defined. The type and extent of control will be dependent upon the type of product, the effect of the purchased product or services on subsequent product realization, and the impact on the quality of the final product.

#### 7.5.1.3 PURCHASING DATA

Purchasing documents shall clearly describe the product ordered, including, where applicable:

- (a) The type, class, grade, or other precise identification;
- (b) The title or other positive identification, and applicable issues of specifications, drawings, process requirements, inspection instructions, and other relevant technical data, including requirements for approval or qualification of product, procedures, process equipment, and personnel, and any changes thereto;

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(c) The title, number, and issue of the Quality System standard to be applied;

(d) Requirements for test specimens (e.g., production method, number, storage conditions) for design approval, inspection, investigation or auditing;

(e) Requirements relative to notifying MSFC of nonconforming product and arranging for MSFC approval of supplier nonconforming material;

(f) Requirements to flow down to sub-tier suppliers the applicable requirements in the purchasing documents, including key characteristics where required.

MSFC reviews and approves purchasing documents for adequacy of the specified purchase requirements prior to their communication to the supplier.

#### 7.5.1.4 VERIFICATION OF PURCHASED PRODUCT

MSFC shall establish and implement the inspection or other activities necessary for ensuring that purchased product meets specified purchase requirements. (Reference MPG 8730.1, "Inspection and Testing.")

Where MSFC or its customer proposes to verify purchased product at the supplier's premises, MSFC shall specify verification arrangements and the method of product release in the purchasing documents.

Verification by the MSFC customer shall not absolve MSFC of the responsibility to provide an acceptable product, nor shall it preclude subsequent rejection by the MSFC customer.

#### 7.6 TRANSPORTATION (6000-6999)

MSFC shall establish and maintain documented procedures/instructions for the management and operation of NASA transportation functions.

The following activities are governed by the Transportation series: (See paragraph 4.a.)

- a. Transportation (General) (60XX)
- b. Commercial Freight Services (61XX)
- c. Traffic Management Programs (62XX)
- d. Transportation of Unusual or Hazardous Cargo (63XX)
- e. Preparation and Handling of Cargo (64XX)

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- f. Special Airlift Services (65XX)
- g. Transportation and Transport Engineering (66XX)
- h. Motor Vehicle Operation and Management (67XX)
- i. Passenger Transportation (68XX)

#### 7.6.1 HANDLING, STORAGE, PACKAGING, PRESERVATION, AND DELIVERY

##### 7.6.1.1 GENERAL

MSFC maintains documented procedures for handling, storage, packaging, preservation, and delivery of products. [Refer to MPG 6410.1, "Handling, Storage, Packaging, Preservation, and Delivery (H.S.P.P.&D.)" ]

##### 7.6.1.2 HANDLING

Handling methods to prevent damage and deterioration, including electrostatic discharge (ESD) sensitive handling and precautions, are implemented and updated routinely.

##### 7.6.1.3 STORAGE

Controlled storage and stock areas are utilized to prevent damage, loss, or deterioration of materials and products. Procedures shall be documented for authorizing the receipt and dispatch to and from these areas. Access to storage areas is limited to authorized personnel. Special provisions will be established and implemented for ESD sensitive, age-sensitive materials, and items stored requiring environmental controls. Periodic assessment of the condition of product in stock to detect deterioration shall be conducted.

##### 7.6.1.4 PACKAGING

Documented procedures and/or packaging plans shall be initiated to define the controls and verification applied to the preservation, packaging, and marking processes (including materials used) to ensure compliance with specified requirements.

##### 7.6.1.5 PRESERVATION

MSFC applies appropriate methods for preservation and segregation of products when the product is under MSFC control.

Preservation of product shall include, where applicable in accordance with product specifications and/or applicable regulations, provisions for:

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(a) cleaning and prevention, detection and removal of foreign objects;

(b) special handling for sensitive products and hazardous materials;

(c) marking and labeling including safety warnings; and

(d) shelf life control and stock rotation.

#### 7.6.1.6 DELIVERY

MSFC protects the quality of product after inspection and test is completed. This protection shall be extended to include delivery to destination.

### 7.7 PROGRAM FORMULATION (7000-7999)

MSFC shall establish and maintain documented procedures/instructions for the management, planning, and administration of Research and Development programs and groups of projects and laboratory type organizations.

The following activities are governed by the Program Formulation series: (See paragraph 4.a.)

- a. Program Formulation (General) (70XX)
- b. Research and Development Planning and Approval (71XX)
- c. Institutional Planning and Approval (72XX)
- d. Facility Planning and Approval (73XX)
- e. Budget Formulation and Execution (74XX)
- f. Commercialization (of NASA Technology and Systems) (75XX)
- g. Program Operating Plans (76XX)
- h. Human Resources Utilization (77XX)
- i. Resources Authority Allocation System (78XX)
- j. Aircraft Operations and Management (79XX)

#### 7.7.1 PROGRAM/PROJECT AND QUALITY PLANNING

MSFC defines and documents how requirements will be met for each project, program, or activity. Program/Project and Quality planning is consistent with all other requirements of MSFC's MMS and is documented in a format to suit MSFC's method of operation. Program/Project and Quality planning is performed per MPG 7120.1, "Program/Project Planning."

In planning product realization, MSFC shall determine the following, as appropriate:



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- (a) objectives, including quality objectives, and requirements for product;
- (b) the need to establish processes, documents, and provide resources specific to the product;
- (c) required verification, validation, monitoring, inspection, and test activities specific to the product and the criteria for product acceptance;
- (d) records needed to provide evidence that the realization processes and resulting product meet requirements.

Configuration management and data management shall be applied, with the optimum degree of uniformity, to all programs and projects procured through contracts or acquired through in-house activities. The configuration management and data management activities that fulfill the requirements of NPD 7120.4, "Program/Project Management," and NPG 7120.5, "NASA Program and Project Management Processes and Requirements," shall be documented and implemented in accordance with MPG 8040.1, "Configuration Management, MSFC Programs/Projects," and MPG 7120.3, "Data Management, Programs/Projects."

All programs/projects are required to prepare a risk management plan during the program/project formulation phase. This plan may be a supplement of the program/project plan. Each program/project will follow a continuous risk management process; this process will be iterated throughout the program/project life cycle. (Reference NPG 7120.5, "Program and Project Management Processes and Requirements.")

## 7.8 PROGRAM MANAGEMENT (8000-8999)

MSFC shall establish and maintain documented procedures/instructions for the management, operation, and performance of Research and Development Projects, including basic and applied research and engineering development projects. MSFC shall also establish and maintain documented procedures and instructions for the management and operation of NASA construction of facilities, architectural, and engineering design functions.

The following activities are governed by the Program Management series: (See paragraph 4.a.)

- a. Program Management - General (80XX)
- b. Advanced Studies (81XX)
- c. Supporting Research and Technology (SRT) (82XX)

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- d. Grants and Research Contracts (83XX)
- e. Tracking and Data Acquisition - General (84XX)
- f. Environmental Management (General) (85XX)
- g. Operations (86XX)
- h. Safety and Mission Assurance (87XX)
- i. Real Property and Facilities (88XX)
- j. Program Medical Support (89XX)

#### 7.8.1 DESIGN AND DEVELOPMENT

##### 7.8.1.1 GENERAL

MSFC departments and offices shall establish and maintain documented procedures to control and verify the design of all products (hardware and software) and facilities, as well as control research, technology and development activities (RT&D), in order to ensure that specified requirements are met.

Procedures pertaining to design of flight hardware, flight software, and flight-associated GSE are defined in MPG 8060.1, "Flight Systems Design/Development Control," MPG 8040.1, "Configuration Management, MSFC Programs/Projects," and MWI 8050.1, "Verification & Validation of Hardware, Software, and Ground Support Equipment for MSFC Projects." Design of facilities is addressed in MPG 8823.1, "Design Control of Facilities." Procedures for design of non-flight and non-facility products are defined in MPG 8060.2, "Non-Flight and Non-Facility Design and Development." Procedures for research, technology, and development activities are defined in MPG 8220.1, "Conduct of Research and Technology Activities."

##### 7.8.1.2 DESIGN AND DEVELOPMENT PLANNING

Design and development activities are assigned to qualified personnel equipped with adequate resources. MSFC prepares plans commensurate with contracts or Collaborative Work Commitments (CWCs) for each design and development activity. The plans describe or reference these activities and define responsibility for their implementation. The design and development stages and the appropriate reviews, verification, and validation are determined during planning. Each flight project will develop preliminary system requirements, a risk management plan, and a configuration management plan during project formulation. The plans for flight projects will be in accordance with MPG 8060.1, "Flight Systems Design/Development Control," and the guidelines established by OMB Circular A-119, "Federal Participation in the Development and Use of Voluntary Standards," for selection of design specifications and standards.

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In the formulation phase, MSFC Programs/Projects shall evaluate use of non-Government voluntary consensus standards in lieu of Government-unique standards in their procurements and regulatory activities, except where inconsistent with law or otherwise impractical, per OMB Circular A-119 and NPD 8070.6, "Technical Standards." Use of non-Government voluntary consensus standards is not required where they would demonstrably fail to serve NASA's Program/Project needs.

Non-flight hardware and facility design planning will be in accordance with MPG 8060.2 and MPG 8823.1, respectively. The plans will be updated as the design evolves.

#### 7.8.1.3 ORGANIZATIONAL AND TECHNICAL INTERFACES

Organizational and technical interfaces between groups which input into the design process are defined and the necessary information documented, transmitted, and regularly reviewed.

#### 7.8.1.4 DESIGN AND DEVELOPMENT INPUTS

Design and development inputs are identified, documented, and reviewed by each appropriate department or office for adequacy and accuracy. These inputs include functional and performance requirements, applicable statutory and regulatory requirements, information derived from previous similar designs (where applicable), and other requirements essential for design and development. Ambiguous, incomplete, or conflicting requirements are resolved with those responsible for imposing the requirements. The results of the contract or CWC review shall be considered during design input. Any changes agreed to will be documented and approved.

#### 7.8.1.5 DESIGN AND DEVELOPMENT OUTPUTS

Design and development outputs are documented and expressed in terms that can be assessed against the design and development input requirements. The design outputs shall meet the design and development input requirements, contain or reference acceptance criteria, and identify critical design characteristics crucial for the safe and proper functioning of the product. This includes appropriate information for identification, purchasing, production, inspection, and for service provision, as well as, operating, storage, handling, maintenance, and disposal requirements. All design output documentation is reviewed and approved prior to release. Records of the review and any necessary actions shall be maintained. (See paragraph 7.1.7.)

#### 7.8.1.6 DESIGN AND DEVELOPMENT REVIEW

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At suitable stages, systematic reviews of design and development shall be performed in accordance with planned arrangements to evaluate the ability of the results of design and development to meet requirements, to identify any problems and propose necessary actions, and to authorize progression to the next stage.

Participants in such reviews shall include representatives of functions involved with the design and development stages being reviewed. Records of the results of the reviews and any necessary actions shall be maintained (see paragraph 7.1.7).

#### 7.8.1.7 VERIFICATION

Verification shall be performed in accordance with planned arrangements (see paragraph 7.8.1.2) to ensure that the product meets the design and development input requirements. Records of the results of the verification and any necessary actions shall be maintained (see paragraph 7.1.7).

#### 7.8.1.8 VALIDATION

Design and development validation shall be performed in accordance with planned arrangements (see paragraph 7.8.1.2) to ensure that the resulting product is capable of meeting the requirements for the specified application or intended use, where known. Wherever practicable, validation shall be completed prior to the delivery or implementation of the product. Records of the results of validation and any necessary actions shall be maintained (see paragraph 7.1.7).

#### 7.8.1.9 CONTROL OF DESIGN AND DEVELOPMENT CHANGES

Design and development changes shall be identified and records maintained. The changes shall be reviewed, verified, and validated, as appropriate, and approved before implementation. The review of design and development changes shall include evaluation of the effect of the changes on constituent parts and products already delivered. Records of the results of the review of changes and any necessary actions shall be maintained (see paragraph 7.1.7).

Changes and modifications to flight designs and specifications shall be in accordance with MPG 8040.1. Non-flight hardware and facility design changes will be in accordance with MPG 8060.2 and MPG 8823.1, respectively.

#### 7.8.2 PRODUCT IDENTIFICATION AND TRACEABILITY

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Where appropriate, MSFC shall establish and maintain documented procedures for identifying the product throughout product realization. (Refer to MPG 8040.2, "Product Identification.") MSFC shall establish and maintain documented procedures for unique identification of individual products or batches requiring traceability. (Refer to MPG 8040.3, "Product Traceability.") Records of such identification are maintained. (See paragraph 7.1.7.)

#### 7.8.3 MONITORING AND MEASUREMENT OF PRODUCT

MSFC shall establish and maintain documented procedures for inspection and testing activities to verify that the specified requirements for products are met. (Refer to MPG 8730.1, "Inspection and Testing.") The required inspection and testing, including monitoring and control of any key characteristics identified, and the records to be established, shall be detailed in the quality plan or documented procedures.

MSFC shall monitor and measure the characteristics of the product to verify that product requirements have been met. This shall be carried out at appropriate stages of the product realization process in accordance with the planned arrangements (see paragraph 7.7.1).

Evidence of conformity with the acceptance criteria shall be maintained. Records shall indicate the person(s) authorizing release of product (see paragraph 7.1.7).

Product release and service delivery shall not proceed until all the planned arrangements (see paragraph 7.7.1) have been satisfactorily completed, unless otherwise approved by a relevant authority, and where applicable by the customer.

MSFC does not process products in volume "production runs," and therefore does not perform first article inspections for these. Verification and validation of flight products are performed in accordance with MWI 8050.1, "Verification & Validation of Hardware, Software, and Ground Support Equipment for MSFC Projects."

#### 7.8.4 CONTROL OF MONITORING AND MEASURING DEVICES

MSFC shall determine the monitoring and measurement activities to be undertaken and the monitoring and measuring devices needed to provide evidence of conformity of product to determined requirements. MSFC shall establish and maintain documented procedures (refer to MPG 8730.5) to ensure that monitoring and measurement can be accomplished and is accomplished in a manner

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that is consistent with the monitoring and measurement requirements.

Where necessary to ensure valid results, measuring equipment shall:

- (a) be calibrated or verified at specified intervals, or prior to use, against measurement standards traceable to international or national measurement standards; where no such standards exist, the basis used for calibration or verification shall be recorded;
- (b) be adjusted or re-adjusted as necessary;
- (c) be identified to enable the calibration status to be determined;
- (d) be safeguarded from adjustments that would invalidate the measurement result;
- (e) be protected from damage and deterioration during handling, maintenance and storage.

In addition, MSFC shall assess and record the validity of the previous measuring results when the equipment is found not to conform to requirements. MSFC shall take appropriate action on the equipment and any product affected. Records of the results of calibration and verification shall be maintained. (See paragraph 7.1.7.)

When used in the monitoring and measurement of specified requirements, the ability of computer software to satisfy the intended application shall be confirmed. This shall be undertaken prior to initial use and reconfirmed as necessary.

#### 7.8.5 INSPECTION AND TEST STATUS

The inspection and test status of the products shall be identified by suitable means, which indicate the conformance or nonconformance of products with regard to inspection and tests performed. The identification of inspection and test status shall be maintained, as defined in the quality plan and/or documented procedures, throughout production, installation, and servicing of the product to ensure that only products that have passed the required inspections and tests or released under an authorized concession (see paragraph 7.8.6.2) are dispatched, used, or installed. Activities relating to inspection and test status are performed in accordance with MPG 8730.2, "Inspection and Test Status."

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#### 7.8.6 CONTROL OF NONCONFORMING PRODUCT

##### 7.8.6.1 GENERAL

S&MA shall establish and maintain documented procedures to ensure that product that does not conform to specified requirements is prevented from unintended use, delivery, or installation. (Refer to MPG 8730.3, "Control of Nonconforming Product.") Controls shall provide for identification, documentation, evaluation, segregation, and disposition of nonconforming product and for notification to the directorate concerned.

##### 7.8.6.2 REVIEW AND DISPOSITION OF NONCONFORMING PRODUCT

Responsibility for review and authority for the disposition of nonconforming product shall be defined. Nonconforming product shall be reviewed in accordance with documented procedures for rework to meet requirements, accept with or without repair, re-graded for alternative applications, or reject/scrap. The proposed use or repair of product that does not conform to specified requirements shall be reported to the customer or customer's representative for approval. A description of the nonconformity that has been accepted and all repairs shall be recorded. Any repaired or reworked product shall be re-inspected by the S&MA Office in accordance with the quality plan and/or documented procedures. Actions appropriate to the effects, or potential effects, of the nonconformity are taken when nonconforming product is detected after delivery or use has started. Records for the identification, documentation, evaluation, segregation, and disposition of nonconforming product/services will be maintained.

##### 7.8.7 STATISTICAL TECHNIQUES

MSFC shall identify where statistical techniques are required for establishing, controlling, and verifying process capabilities and product characteristics.

MSFC shall establish and maintain documented procedures to implement and control the application of the statistical techniques as needed. (Refer to MPG 8730.4, "Statistical Techniques.")

#### 7.9 FINANCIAL MANAGEMENT (9000-9799)

MSFC shall establish and maintain documented procedures/instructions for the management and operation of NASA Accountable Officer's accounts.

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The following activities are governed by the Financial Management series: (See paragraph 4.a.)

- a. Principles and General Policies (90XX)
- b. Agencywide Coding Structure (AWCS) (91XX)
- c. Accounting (92XX)
- d. Financial Reports (93XX)
- e. Contractor Financial Management Reporting (95XX)
- f. Fiscal Operations (96XX)
- g. NASA Travel Regulations (97XX)

## **8. RESPONSIBILITIES**

See section 7.1.1.4.a., Responsibility and Authority.

- a. The MSFC Center Director is responsible for implementation and control of the MMS, including providing sufficient resources for MMS activities.
- b. All MSFC employees are responsible for understanding and complying with the MMS and MSFC's policy for quality.
- c. The Management Representative is responsible for maintenance of this MMM.

## **9. RECORDS**

Records requirements are defined in the appropriate reference documents.

## **10. MEASUREMENT**

- a. Third-party certification of the MMS to the ISO 9001 standard in accordance with NPD 1280.1, "NASA Management System Policy."
- b. Third-party certification to the AS9100 standard for the design, development, production, installation and servicing of flight hardware, flight software, and associated ground support equipment interfacing with flight hardware and flight software.
- c. Ongoing maintenance as measured by subsequent successful re-certifications.
- d. MSFC internal quality audits of the MMS in accordance with paragraph 7.1.8.



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## 11. CANCELLATION

MPD 1280.1J dated January 27, 2003

Original signed by  
Axel Roth for

A. G. Stephenson  
Director